

ACCESS CONTROL & PRIVACY PRESERVING DYNAMIC ONLINE
MARKETING SERVICES SYSTEM

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Abstract

The automotive sector is feeling the effects of e-commerce more and more frequently. It's quite important to pay attention to how people go about purchasing auto parts. Customers have to go through a lot of hassle and risk subpar quality when ordering auto parts from a store far away. Our business's mission is to automate the process through which dealers and customers exchange auto parts. The site will guide retailers into adopting new production processes, as well as analyse the current market velocity of various products, the entire transaction, and the realised profit from the sold things. The platform provides a venue for vendors to interact with their end-users and guarantee greater returns. The website will function as a protected platform for advertising goods and services. This app will let merchants sell their wares across the country by providing them with access to the platform's core features and supporting documentation. This venture enables customers to view a variety of products and promptly purchase desired items using online instalments.

ARTICLE INFO

Article history:

Received 3 May 2023

Revised form 15 Jun 2023

Accepted 5 July 2023

Key words: Access Control, Privacy-Preserving, Dynamic, Online Marketing, Services System

Introduction

The vehicle spare parts business was designed with selling and buying organisations in mind. This system handles the management of dealers, customers, products, sales orders, and purchases [1]. The trader is given a platform to automate record-keeping [2]. Our project goal is to create a software application that will lessen the amount of manual effort required to manage orders, customers, dealers and inventories [3]. This project aims to assist the administrator in running his business. Customer information can be kept in the database by the admin. There is no need to enter the customer's information again when he returns the next time [4-9]. It is selectable from a list showing all customers.

Objectives

- To allow users to protect the privacy of their personally identifiable information (PII)
- To reduce and prevent fraudulent activities in the supply chain
- To improve the accuracy in the traceability of the products
- To utilise customer feedback to provide an improved experience.
- To reduce costs by providing a central platform for businesses to connect and transact with each other online.

Scope of the project

The scope of this project can be quite extensive and far-reaching. Here are some potential scope areas: The application can include more product lines beyond vehicle spare parts, such as automotive accessories, tires, and other related products [5]. The application can expand its market reach by targeting customers and sellers from other regions or countries. Overall, the scope of such a project can be broad, depending on the business's goals and objectives. It can be customised and expanded to meet the changing needs of the market and the users it serves; to determine the types of sales management systems utilised by users' experiences with the current systems, a requirements analysis was conducted [6-12]. This procedure resulted in the separation of systems into two main categories: manual systems and computerised systems. Most businesses using the manual systems where daily sales products are kept responded that the computerised systems were the most effective and convenient [13]. However, they did not use them due to their difficulty, the cost of buying a full package, and technical features [14-19]. Additionally, it was noted that some users of computerised systems maintained daily sales books, explaining that their salespeople required a sales record [20].

Literature Survey

DSA, two distinct user groups can share a single spectrum channel: primary users, who are guaranteed bandwidth during peak times, and secondary users, who can access the channel only when the primaries are not using it. We take into account a scenario in which a large territory (say, a state) is partitioned into smaller regions and numerous primaries own bandwidth in each of these locations (e.g., towns). If a primary has spare capacity during a given time slot, they might be willing to rent it out to a secondary at a number of locations where they won't interfere with each other [21]. As a result, the primary commodities experience price competition. Because of the need to simplify the analysis, previous research on this price rivalry has only been conducted assuming that the price of each primary is continuous [22]. However, in reality, the range of feasible costs is finite [23]. In this study, we examine what happens to price-competing parties when we no longer make this continuity assumption. Our research shows that games with continuous and discrete pricing sets are distinct in several significant ways. For instance, in the game with continuous price sets, there is no pure strategy Nash equilibrium (NE), whereas in the game with discrete price sets, there may be a pure strategy NE [24]. Furthermore, unlike the game with continuous price sets, which has only one NE, the game with discontinuous price sets has several symmetric NE. We demonstrate, however, that the strategies of the primary under every symmetric NE converge to the unique NE strategy of the game with continuous price sets as the number of available prices grows large in the discrete pricing game [25].

We explore a secondary spectrum market in which key operators share channels across many geographies. Each primary makes money by charging secondary stations for access to its channel. However, the secondary antennas can't broadcast at overlapping nodes [26]. For each channel that becomes available for sale, the primary must choose a selling price and a set of non-overlapping locations. In the conflict graph depiction of the area, the set of non-interfering places is shown to be autonomous. Finding an approach for each channel state vector is the fundamental requirement [27]. When the number of nodes in a graph is considerable, node symmetric conflict graphs naturally form (potentially infinite). We also take into account a symmetric link between the joint probability distribution of the channel state vectors due to the symmetry in the interference relationship. We explicitly compute a symmetric NE and prove its existence [28]. In the symmetric NE, for any given channel state vector, a primary randomly selects one

of the maximal independent sets. For the few places we acquired in our previous investigations, the symmetric NE method displays some significant structural variations. To further understand how maximal independent sets are calculated, we also conduct theoretical and empirical research into the predicted component size in random conflict graphs [29]. Based on our findings, the average size of a component is rather standard, but it can be quite large if the channel availability probability is quite high. We demonstrate that a primary can use random sampling to control the average size of a component. We provide a numerical analysis of the ratio between primaries' expected payoff in the game and their payoff when all primaries conspire [30].

For businesses that deal with other businesses, e-commerce has developed into a significant source of competitive advantage. It allows them to work more effectively with their customers and suppliers while reducing transaction costs and providing a plethora of additional services. This article thus investigates the benefits of B2B E-Commerce, how it is utilised by industrial firms, and the means by which these firms provide their services. Given the paper's focus on the growing theoretical and practical importance of services in the context of evolving information technologies and their impact on business, it is timely. It could be used as a springboard for more in-depth studies of B2B market strategies and E-Commerce analysis as it provides a review and summarises a broad theoretical background on the topic. Companies can use this document as a resource when deciding how to allocate funds for E-Commerce [31-38].

Interest in dynamic spectrum access is on the rise as the relevance of wireless communications rises. For this reason, we need management strategies that effectively facilitate spectrum sharing between main users (PU) with licences and secondary users (SU) without such licences (SU). In such a case, PUs are guaranteed to retain their usage priority above any SU. Furthermore, no PU shall be harmed by any SU. Cognitive Radio equipment with adjustable operating settings can make this a reality. Following a discussion of various economic and technical models for achieving efficient spectrum sharing, we suggest a model in which a spectrum broker regulates a secondary market on demand to allocate resources. This strategy incentivizes cooperation amongst users by providing financial benefits: The broker assesses fees to SUs for PUs' use of resources, although SUs are protected from liability in the event of expulsion. Here, we outline the key features of such a system and discuss the allocation choices the broker should make to maximise economic advantage, despite fluctuations in user activity. Several no-regret algorithms based on the advice of internet experts are developed and tested using a variety of user behaviour patterns. The results are compared to those of dynamic programming in order to determine how practical they are [39-45].

Business-to-business (B2B) transactions are rapidly becoming the norm in the world of online shopping. Despite growing attention, the definition and measurement of B2B website user satisfaction have not yet been established. Moreover, conventional measures of customer satisfaction with B2B e-commerce platforms, such as the User Information Satisfaction (UIS), End-User Computer Satisfaction (EUCS), and Customer Information Satisfaction (CIS), are narrowly tailored to the Information System (IS) context. This article develops a five-dimensional "a Scale of B2B E-commerce Website Customer Satisfaction" (B2B-ECWCS), investigates the factors that affect B2B-ECWCS, suggests an effective formula for calculating B2B-ECWCS, and, finally, discusses methods for gauging Alibaba's website's customer satisfaction [46-53].

System Analysis

The existing web-based B2B marketplaces implement sequential adjusting algorithms. These algorithms can be used to model the behaviour of different actors in an online marketplace, such as buyers and sellers and to identify equilibria that maximise the utility of each actor [54]. One specific application of these algorithms in online marketing web apps is in the field of dynamic pricing. The app provider adjusts the price of a product or service in response to changes in demand and competition to maximise their revenue (fig.1).

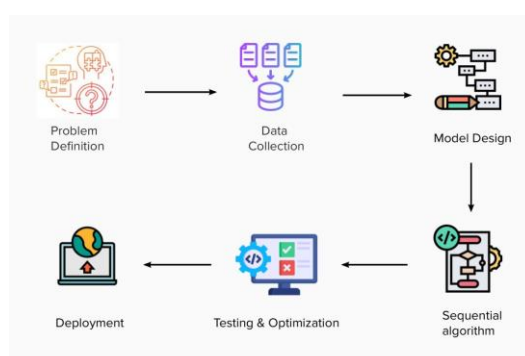


Figure 1: Working of sequential adjusting algorithm**Disadvantages:**

Computationally Intensive: It can be computationally intensive, particularly involving large datasets or complex models. This can result in slow processing times and potentially impact the application's user experience [55].

Limited Scope: It is designed to optimise specific objectives within a defined set of variables. As a result, they may not be suitable for all marketing contexts and may not capture all relevant factors that influence customer behaviour and market outcomes [56].

Requires Accurate Data: It relies on accurate and timely data to make informed pricing and marketing decisions. Inaccurate or incomplete data can lead to suboptimal results or negatively impact business outcomes [57].

Potential for Market Distortion: It can sometimes create distortions that impact other market participants or lead to unintended consequences. For example, aggressive pricing strategies could lead to a price war that harms profits for all competitors in the market [58].

Limited Explanation: It is often complex and difficult to explain to stakeholders, making it challenging to gain buy-in from internal teams or justify pricing decisions to customers [59].

While sequential adjusting algorithms can be a powerful tool for optimising online marketing, it's important to consider these potential disadvantages and weigh them against the potential benefits [60].

Proposed System

The proposed system offers a more efficient approach to implementing a better online marketplace. The DES algorithm is used to protect the user's personal information and finances from unauthorised access. A significant machine learning algorithm named Naïve Bayes is used to classify articles and provide the user with personalised experiences. Since the owner runs the business among several competitors, user-side reviews will help to upgrade their business service. Based on the user's feedback or the owner's wishes can change their product prices [61-67]. These changes will reflect the user view price list. By customising product attributes, owners can get regular customer visits.

Technique:

- Naïve Bayes Classifier
- DES algorithm

Advantages

Speed: DES is relatively fast and efficient in encrypting and decrypting data. This is particularly useful in a web app environment where quick response times are necessary for a good user experience.

Security: DES is a well-established encryption standard that has been thoroughly analysed and tested. It provides strong encryption and can protect sensitive data such as customer information, financial data, and business secrets from unauthorised access.

Compatibility: DES is widely used and supported by most modern computer systems, making it a reliable choice for encrypting data in a B2B online marketing web app.

Flexibility: DES is a block cipher that can be used to encrypt data in a variety of modes, such as Electronic Codebook (ECB), Cipher Block Chaining (CBC), and Counter (CTR) mode. This allows the encryption to be tailored to the specific needs of the B2B online marketing web app.

Cost-effective: DES is a widely available encryption standard often included in software libraries, making it a cost-effective option for implementing encryption in a B2B online marketing web app [68-71].

Naïve Bayes

Fast and efficient: Naive Bayes is a computationally efficient algorithm and requires relatively little memory. This makes it well-suited for real-time applications such as online marketing, where fast response times are essential.

Easy to implement: Naive Bayes is a relatively simple algorithm, making it ideal for developers with limited experience in machine learning.

Good performance: Despite its simplicity, Naive Bayes can achieve high accuracy in many classification tasks, including text classification, sentiment analysis, and spam filtering. This makes it well-suited for identifying potential customers and predicting their behaviour.

Handles large feature spaces: Naive Bayes can handle many features, making it well-suited for applications that involve many attributes or variables.

Robust to irrelevant features: Naive Bayes is robust to irrelevant features and can still perform well even if some of the input features are irrelevant to the classification task [72-81].

Handles binary and multi-class classification: Naive Bayes can be used for both binary and multi-class classification tasks, making it a versatile algorithm for many applications.

Overall, the Naive Bayes algorithm is a powerful tool for classification in B2B online marketing web apps, and its efficiency, accuracy, and versatility make it a popular choice for a wide range of classification tasks.

System Specification

These are the necessities for doing the endeavour. Without using these devices and programming, we can't do the endeavour. So, we have two necessities to do the undertaking. They are

- Equipment Requirements (Hardware Requirement)
- Programming Requirements (Software Requirement)

Hardware Requirements

Since a contract for the system's implementation may be based on the hardware requirements, they should be exhaustive and consistent. The requirements could serve as the rationale for an approach to the implementation of the framework [82-85]. They should be a complete and predictable representation of the whole composition. The improvement plan's originators include them from the get-go. Not how the enhancement should be completed is demonstrated. You can think of the software requirements document as the system's blueprint. It needs to define the problem and list the criteria for solving it. It is a list of desired outcomes, rather than methods, for the system. The software requirements specification is built upon the foundation laid by the software requirements. Costs may be estimated, activities can be planned, tasks can be completed, and the teams' progress can be monitored as the project progresses. An operating system (OS) is the software that controls and coordinates the computer's various components. It's a service platform for software applications [86-91].

Languages Used- Java

Java is a programming language first made by James Gosling at Sun Microsystems and passed on in 1995 as a point of convergence of Sun Microsystems' Java stage. The language translates a huge load of its sentence structure from C and C++; at any rate, it has a less risky article model and less low-level work environments. Java applications are usually joined to byte code that can run on any Java Virtual Machine (JVM), paying minimal admonition to PC adequacy, state flexibility, and security, gains it the ideal ground for network signing up [92-95].

Objectives of Java

To see spots of Java, considering everything in our customary presence, research java.com. A real region has been attempted, refined, extended, and shown to Java. With its adaptability, comfort, and portability, Java has become vital for engineers by engaging them to: Make activities run inside a Web program and affiliations [96].

Enable server-side applications for online gatherings, stores, studies, and HTML structures making due, and that is only the start. To be an Object-Oriented language, any language should follow the four ascribes.

Encapsulation refers to bundling data and methods that operate on that data within a single unit or object. Encapsulation aims to hide an object's internal details and expose only those relevant details to other objects.

Inheritance refers to creating new classes by inheriting properties and behaviours from existing classes. Inheritance allows the reuse of code and facilitates the creation of more specialised classes.

Polymorphism: Polymorphism is achieved through method overriding and method overloading, which allow different classes to have methods with the same name but different implementations.

Abstraction refers to defining objects in terms of their essential characteristics, ignoring the irrelevant details. Abstraction is achieved by defining abstract classes or interfaces that specify a set of methods [97].

System Design

The class diagram is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, and the relationships between them [98]. The classes in a class diagram represent both the main objects and or interactions in the application and the objects (fig.2).

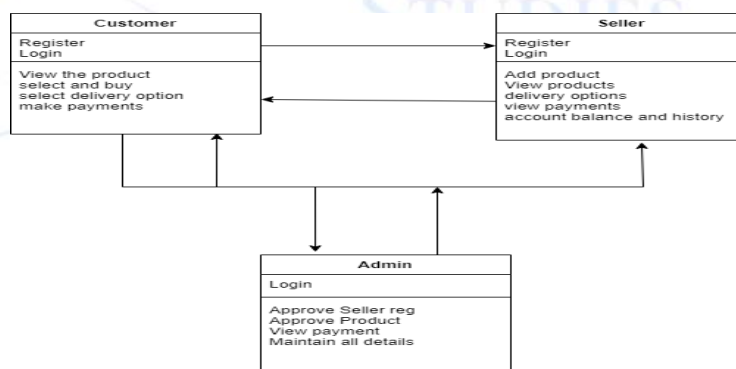


Figure 2: Class Diagram

Sequence Diagram

The sequence diagram can show both synchronous and asynchronous communication between objects. Synchronous communication occurs when the sender waits for a response from the receiver before proceeding. In contrast, asynchronous communication happens when the sender sends a message and continues its execution without waiting for a response.

Activity Diagram

Generally speaking, an activity diagram is a visual representation of a process that includes choices, iterations, and concurrency to depict the sequence of activities and tasks that must be performed. Using the Unified Modeling Language (UML), activity diagrams can be used to detail the sequential actions performed by various parts of a system. The inner workings of a complicated process might be modelled using UML activity diagrams. UML activity diagrams are the object-oriented counterpart to structural development's flow charts and data flow diagrams (DFDs).

Data Flow Diagram

The "flow" of data through an IT infrastructure can be visually represented with a data flow diagram (DFD). The data flow is shown instead of the control flow in a programme, setting it apart from a flowchart. One more tool for visualising data processing is the data flow diagram. The DFD is meant to illustrate the breakdown of a system into subcomponents and the communication between them (fig.3).

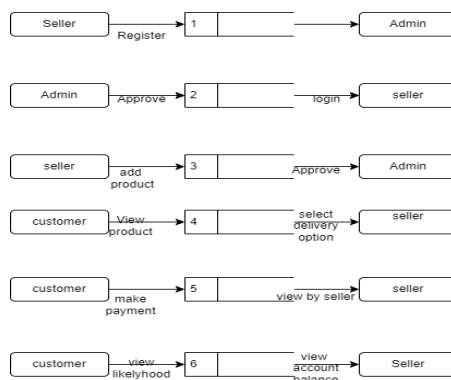


Figure 3: Data Flow Diagram

System Architecture Diagram

System architecture refers to the overall design of a system, including its components, their interactions and how they work together to achieve specific goals or functions. It involves the process of planning, designing, implementing and maintaining a system. A system architecture typically consists of various elements such as hardware, software, network infrastructure, protocols, data storage and user interfaces. It also includes the relationships and interactions among these components and their dependencies and constraints. The purpose of a system architecture is to provide a blueprint or a roadmap for building and deploying a system that meets specific requirements, such as performance, scalability, reliability, security and maintainability. A well-designed system architecture can improve system efficiency, reduce development costs and ensure that the system meets the needs of its users (figs 4 to 14).

Like the client, the seller must also register themselves to be identified as a verified user and sell their product.



Figure 4: Seller Registration

The enlisted seller is ready to log in by utilising the enrolled details. Only if the username and password are correct will it move to the primary page else; it will show an error message.



Figure 5: Seller Login

The vendor can add items by providing adequate features, including contact details for client queries. Assuming that the dealer is intrigued, they could be capable of adding any measure of items here.



Figure 6: Add Product

In this module, the seller can view the order after the client places it. Clients can also view their order history, track the status of their orders and manage their delivery preferences.



Figure 7: View Order

The register module provides a conceptual framework for entering data to the application in a way that: simplifies and improves data entry and accuracy by matching the user entry to the data source (typically paper files created at the point of care); easily ties back to individual user records to connect registers to user data; and collects data elements to enable better supervision of donation programmes.



Figure 8: Customer Registration

This section of our project represents a single transaction that is executed against a database in a database management system (or similar system) and is handled consistently and reliably apart from all other transactions. Any time a user makes a modification to their account in a database, they are completing a transaction.



Figure 9: Customer Login

Once logged in, users can browse through the product catalogue to view available products and services. This catalogue may include product descriptions, pricing information and images.



Figure 10: View Product

Here the client can add their desired items to their shopping cart. This allows them to create a list of products they want to purchase or reorder.



Figure 11: Add to Cart

After the enrollment of the dealer, it will inform the administrator. If the administrator endorses the enrollment of dealers, they can log in whenever they want. This ensures that only authorised users can access the application and perform business-related functions.



Figure 12: Seller Approval

The admin needs to approve the product added by the seller, or else it won't be displayed to the client and can't get it included in this application.



Figure 13: Product Approval

In this module, the admin can maintain the user list. The administrator needs to keep up with the details of who purchased items by involving in this application.



Figure 14: Maintain User List

Reporting and Analytics

Reporting and analytics tools to help business track their performances and identify areas for improvement. This includes metrics such as sales, revenue, inventory levels, and customer feedback. Since the owner runs the business among several competitors, user-side reviews will help to upgrade their business service. The owner can change their product prices based on the user's feedback. These changes will reflect the user view price list. By customising product attributes, owners can get regular customer visits.

Data Encryption Standard is referred to as DES. It is possible to break the DES algorithm using certain equipment. The DES algorithm uses a 56-bit key. USING THIS KEY, the DES creates a block of 64-bit cypher text from a block of 64-bit plain text. There are multiple phases in the DES process, and each step is referred to as a round. The number of rounds changes depending on what size key is being used. For instance, a 128-bit key needs 10 rounds, and a 192-bit key needs 12 (fig.15).

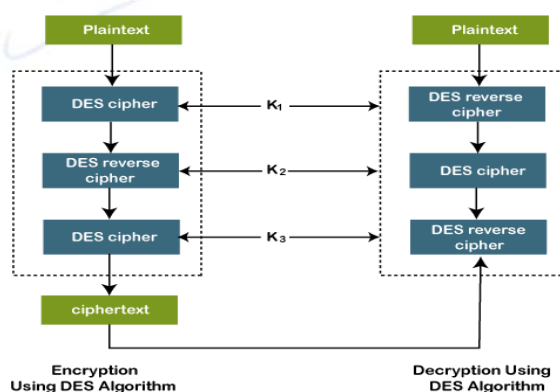


Figure 15: Encryption and Decryption in DES [99]

Modes of operation

Each 64-bit block in the ECB is encrypted and decrypted separately. Each 64-bit block in a CBC cypher is dependent on the one before it and employs an Initialization Vector (IV). In Cipher Feedback (CFB), the plaintext is XORed with the pseudorandom output from the encryption algorithm, which was generated using the cypher text from the previous unit as input. In Output Feedback (OFB), the input to the encryption method is the output of the DES that came before it, similar to how CFB works. Each plaintext block is XOR'd with a secret counter (called a "counter") before being encrypted. For each subsequent block, the counter is increased by one.

Naïve Bayes Algorithm

Naive Bayes algorithm is a popular machine learning algorithm widely used in various applications, including online B2B web apps. Its role in such apps is to perform classification tasks, where it is used to predict the likelihood of a given input belonging to a particular class or category. The B2B web application receives input data (X) from the user or another source. This input data is then passed to the Naive Bayes classification model, which uses probabilistic calculations to predict the likelihood of the input belonging to a particular class or category. Based on the predicted class (Y), the web application takes some action or produces some output. For example, if the input data is an email message and the Naive Bayes model predicts it is spam, the web app can move it to the spam folder or mark it as spam. The Naive Bayes algorithm is critical in helping the online B2B web app automate decision-making processes and provide personalised experiences for users based on their input data. The algorithm predicts the user's role in this application based on their login credentials. Here are the steps for implementing the Naive Bayes algorithm in this web application: Data Collection: Collect data on the login credentials of each user in the system. We will collect data on each user's username, password, and role for this example.

Data Preprocessing: Preprocess the data by converting the login credentials into numerical values that the Naive Bayes algorithm can use. For example, we can assign a numerical value of 1 to the customer, 2 to the admin, and 3 to the seller. Training the Model: Train the Naive Bayes model using the preprocessed data. The model will use the login credentials to predict each user's role. Dashboard Pages: The algorithm is also implemented in the dashboard pages for customers, admin and sellers, where users can perform various actions such as querying the database for available spare parts.

Query Module: The algorithm is also applied where users can search for spare parts based on their requirements. Depending on their role, they may have access to different types of queries.

Integration with Web Application: Integrate the Naive Bayes model with the web application by creating a Servlet to handle the login requests. The Servlet will receive the username and password from the user, preprocess the data, and pass it to the Naive Bayes model. The model will predict the user's role, and the Servlet will redirect the user to the appropriate page based on their role.

Integration Testing

To ensure that all parts of an application work together, we use integration tests. Event-driven testing focuses on the most fundamental results of screens and fields. Even though each part was adequate on its own, as evidenced by passing unit tests, integration tests prove that the whole works as expected. The goal of integration testing is to reveal issues that manifest as a result of putting different parts together.

Functional Testing

Functional testing is a methodical way to prove that the system works as intended, in accordance with the business and technical specifications, the system documentation, and the user guides. The following are the primary foci of functional testing: Functional test planning and execution pay special attention to requirements, critical functions, and unique test cases. In addition, testing should take into account a comprehensive set of scenarios involving the determination of Business process flows, data fields, established procedures, and subsequent activities. Before functional testing is complete, it is possible to identify additional tests and evaluate their usefulness. System Testing verifies that the totality of an installed piece of software is up to par. It puts a set up to the test to see if it yields the expected outcomes. The system integration test that focuses on the system's setup is an example of a system test. Process descriptions and flows provide the backbone of system testing, with an emphasis on the integration points and links that are driven in advance.

User Acceptance Testing

A system's success hinges on how well it is received by its intended audience. In order to ensure that the system under consideration will be well received by its intended end users, it must first be put through rigorous user acceptance testing.

- Input screen design.
- Output screen design.
- Online message to guide users.
- Format of the ad-hoc reports and other outputs.

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Conclusion And Future Enhancement

For businesses that deal with other businesses, e-commerce has developed into a significant source of competitive advantage. It allows them to work more effectively with their customers and suppliers while reducing transaction costs and providing a plethora of additional services. Therefore, the purpose of this article is to investigate the ways in which B2B E-Commerce is utilised by industrial firms, the services it enables, and its primary benefits. The article takes on great practical and theoretical importance for the business environment in light of the ever-increasing importance of the service in B2B marketplaces and the rapid development of information technologies. It could be used as a springboard for more in-depth studies of B2B market strategies and E-Commerce analysis as it provides a review and summarises a broad theoretical background on the topic. The document can also help businesses when deciding whether or not to invest in E-Commerce. Possible improvements include integrating the app with Internet of Things (IoT) devices, including sensors and trackers put in automobiles, to provide real-time data on the condition of those parts. Customers might thus make more educated judgments when shopping for replacement components, and vendors could detect problems with their stock earlier. Sharing purchases with friends and family has never been easier thanks to the app's potential integration with social networking networks. Promotion of the app and name recognition might benefit from this. Blockchain Integration: The application may incorporate blockchain technology to increase the safety and transparency of financial transactions. This has the potential to reduce instances of fraud and boost confidence in the marketplace.

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